

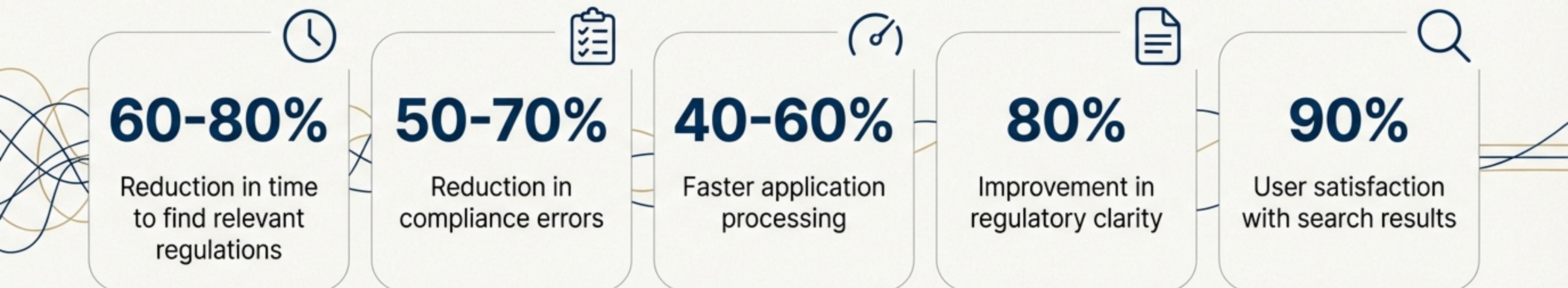
Regulatory Intelligence Assistant

A Submission to the G7 GovAI Grand Challenge 2025

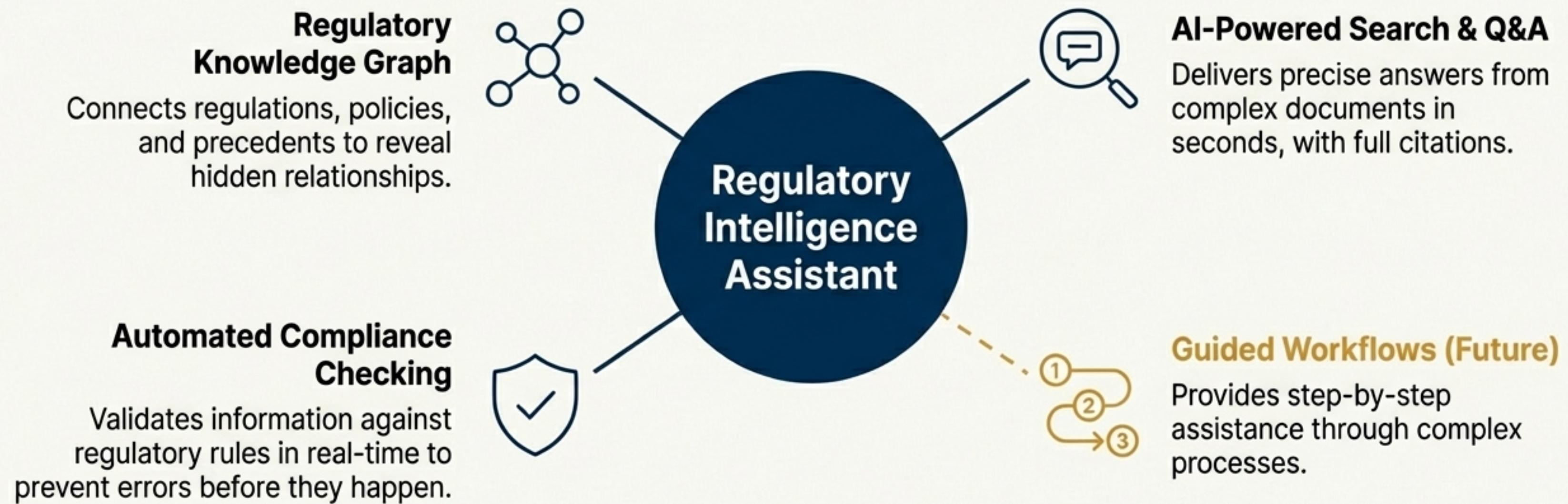
“ Challenge Statement Highlight:
Answering the call to ‘Navigate complex regulations efficiently and accurately.’
Core Value Proposition:
An AI-powered system that transforms dense regulatory landscapes into clear, actionable intelligence for public servants and citizens.

The high cost of regulatory complexity creates significant friction in public service.

Navigating dense legal text is a major bottleneck, leading to errors, delays, and public frustration. Our goal is to create measurable improvements across the board.



We built an integrated platform to deliver intelligence at every stage of the regulatory journey.



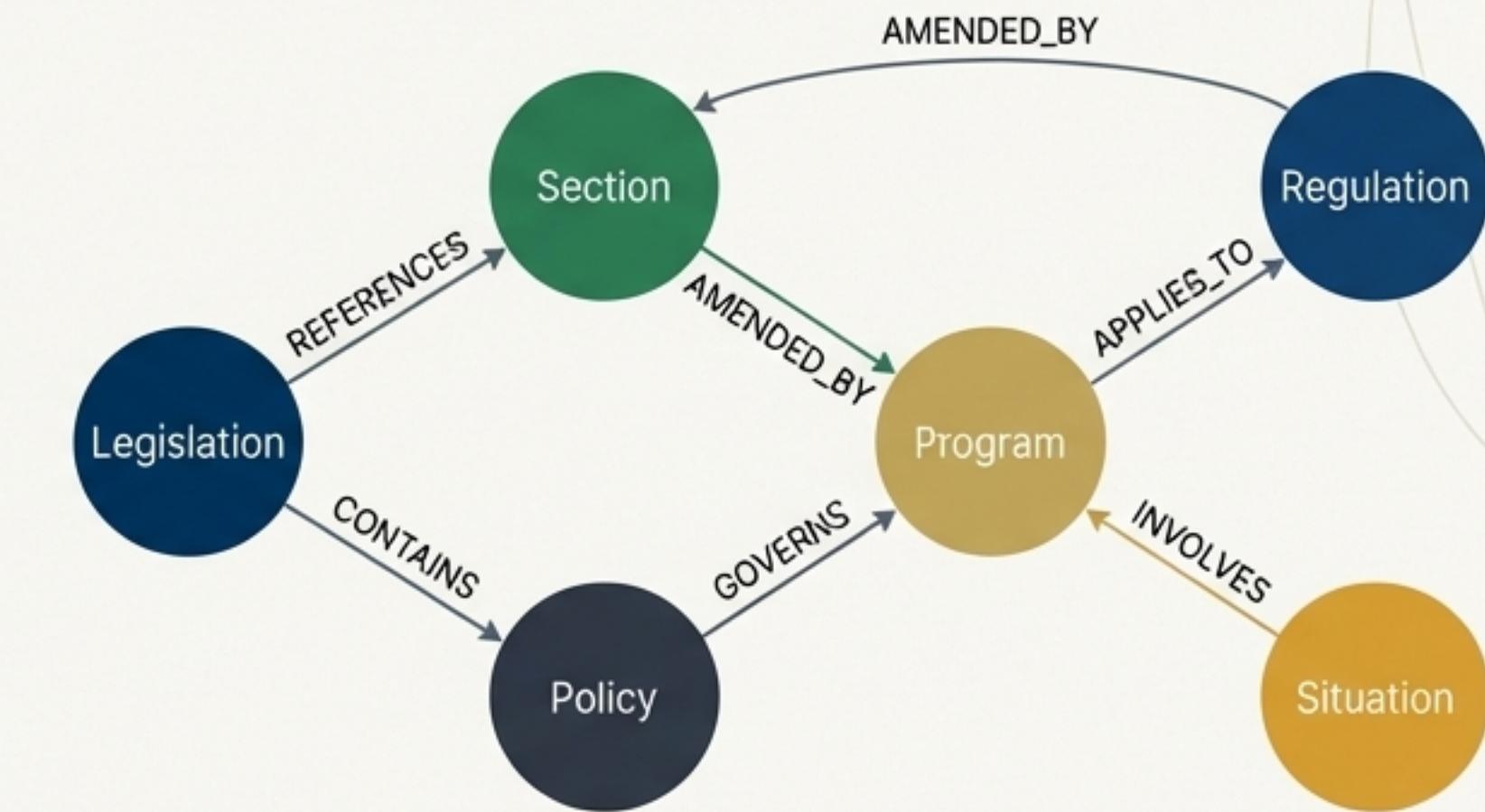
The system's intelligence starts with a Knowledge Graph that maps the entire regulatory landscape.

Core Technology

We use a **Neo4j Graph Database** to model the complex interconnections between laws, policies, and precedents. This goes beyond simple text search to understand context and relationships.

Key Capabilities

- ➡ **Automatic Relationship Extraction:** Intelligently links related regulations and amendments.
- 🏷️ **Entity Linking:** Connects programs, situations, and affected parties.
- 🕒 **Version Control:** Tracks changes over time to ensure accuracy.
- 🌐 **Visual Exploration:** Enables analysis through the Neo4j Browser interface.



Technical Snapshot

Schema: 6 Node Types (Legislation, Section, Program, etc.),
9 Relationship Types (REFERENCES, AMENDED_BY, etc.).

API: 10+ endpoints for graph querying and traversal.

Users can ask questions in plain language and receive precise, cited answers in seconds.

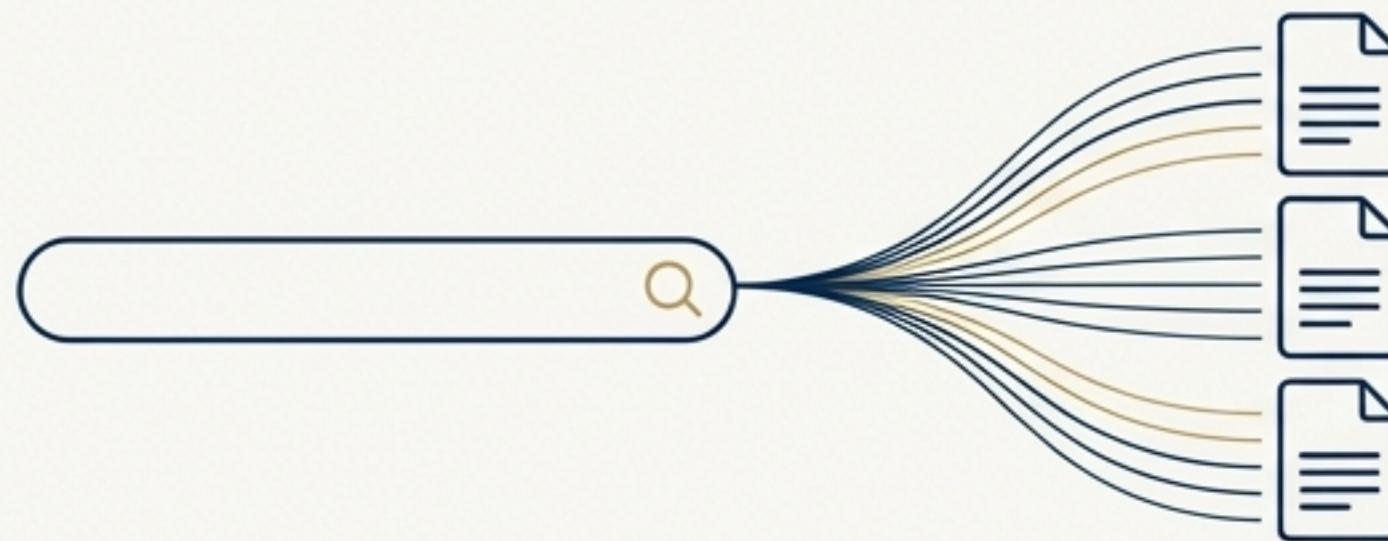
Semantic Search

Find the right document, instantly.

Technology: Hybrid Search combining keyword (BM25) and vector (semantic) search.

Performance: < 500ms hybrid search latency.

Features: Natural Language Queries, Faceted Filtering (Jurisdiction, Date, Type).



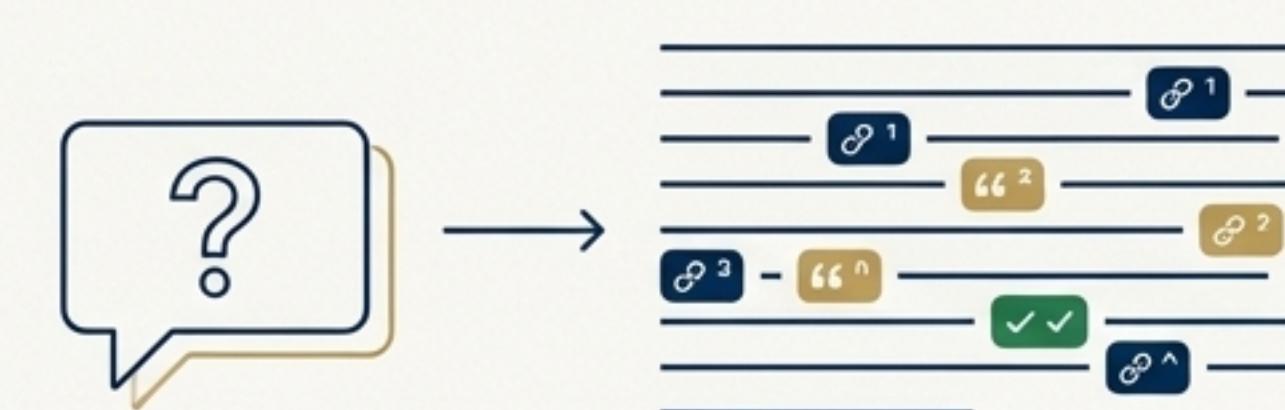
AI-Powered Q&A

Get clear answers, not just links.

Technology: Retrieval-Augmented Generation (RAG) system powered by the **Gemini API**.

Performance: ~2.5s average response time.

Features: Answers in plain language, direct links to source citations, and a 4-factor confidence score for reliability.



We built a multi-layered compliance engine to ensure accuracy and eliminate errors.



Step 1: Requirement Extraction

Automatically identifies obligations from regulatory text using 4 pattern types (mandatory, prohibited, conditional, eligibility).



Step 2: Real-time Field Validation

Provides instant feedback as users type, with < 50ms response time. Supports 8 validation types (required, pattern, range, conditional, etc.).

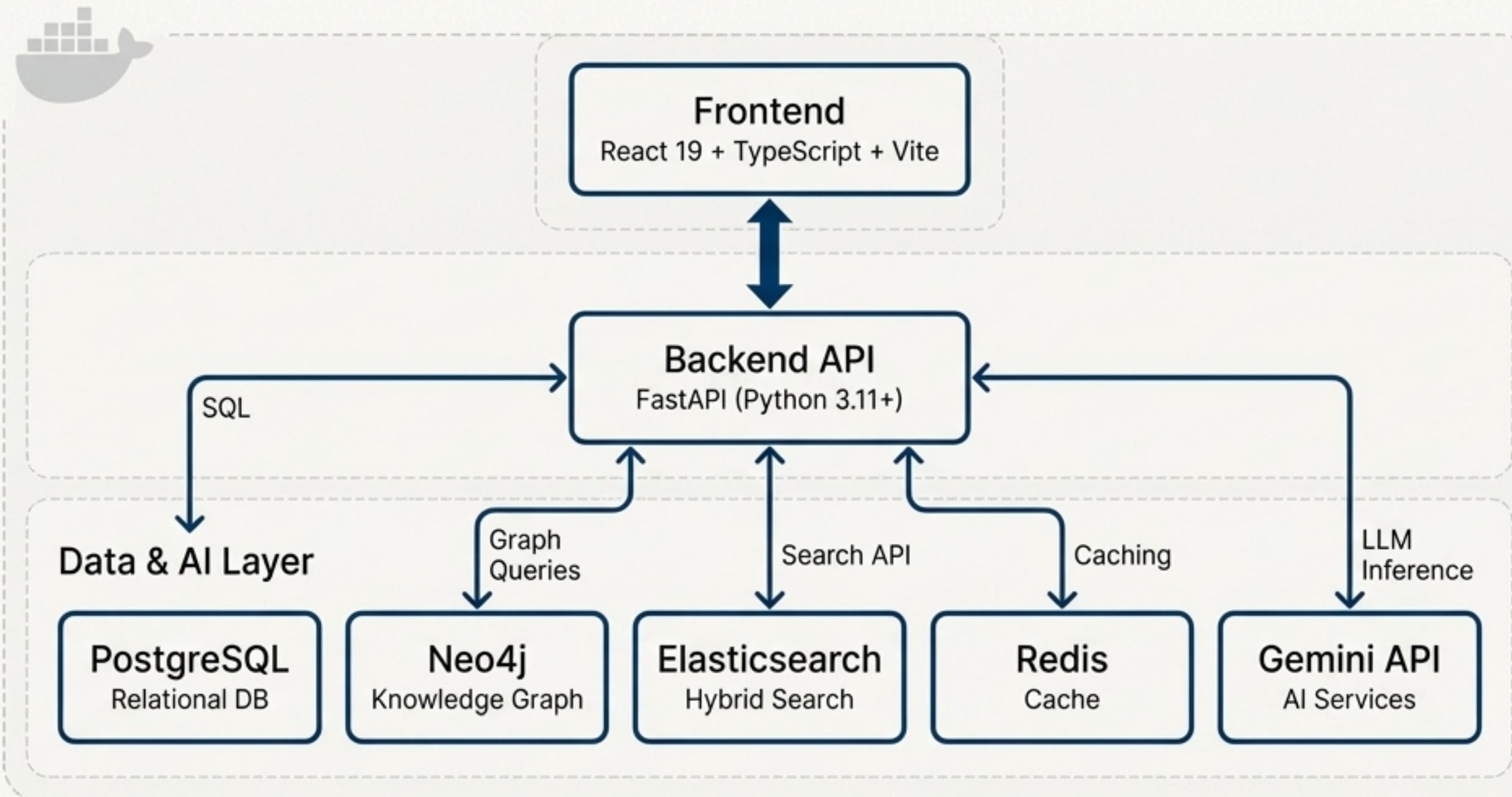


Step 3: Full Compliance Checks & Reporting

Performs comprehensive validation before submission in < 200ms. Generates actionable reports with issue descriptions, regulatory citations, and suggestions for resolution.

The entire system is exposed via 6 dedicated REST API endpoints for integration.

The **platform** is built on a modern, containerized, and **service-oriented** architecture.



The entire stack is orchestrated with Docker Compose, ensuring consistent and reproducible deployments. 50+ REST endpoints provide comprehensive access to all services.

The Regulatory Intelligence Assistant is MVP-ready and fully demonstrable today.

Ready for MVP Demo

Implemented Features Checklist

- Core Infrastructure:** Fully containerized services (PostgreSQL, Neo4j, Elasticsearch, Redis).
- Knowledge Graph:** Schema, services, and API fully operational.
- Semantic Search:** Hybrid search engine with faceted filtering, targets met.
- AI-Powered Q&A:** Gemini RAG system with citations and caching is live.
- Compliance Checking:** Real-time and full validation engines are complete.
- Data Ingestion Pipeline:** Custom parser for Canadian law is functional.
- Frontend Application:** 4 core pages are built, responsive, and accessible (WCAG 2.1 AA).

Current Dataset: 100 Canadian federal acts loaded, indexed, and fully searchable.

Our system has been rigorously validated with a comprehensive, multi-layered testing strategy.

397 Total Tests — 100% Passing Rate

Backend Testing (Pytest)

- A large number **338 tests** covering all services.
- **92%** average code coverage.

- Includes unit, integration, and E2E workflow tests.
- **Key suites:** Search (55 tests), Compliance (45 tests), Legal NLP (48 tests).

Frontend Testing (Playwright)

- A large number **59 End-to-End tests**.
- Covers all 4 pages and core user journeys.
- Tested across 6 browser/device configurations (Chromium, Firefox, WebKit, Mobile, Tablet).

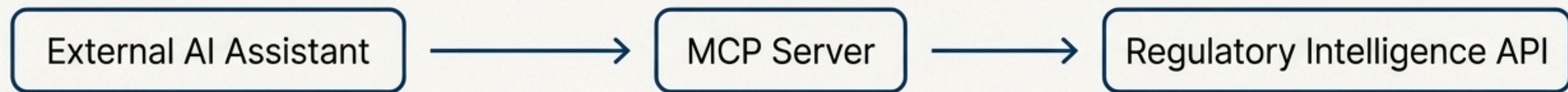
- Validates responsive design and WCAG 2.1 AA accessibility.

All core services meet or exceed their target performance benchmarks.

Endpoint Type	Target Latency	Current Performance	Status
Keyword Search	<100ms	~80ms	 Met
Vector Search	<400ms	~350ms	 Met
Hybrid Search	<500ms	~450ms	 Met
RAG Q&A	<3s	~2.5s	 Met
Field Validation	<50ms	~35ms	 Met
Full Compliance Check	<200ms	~175ms	 Met
NLP Entity Extraction	<100ms	~75ms	 Met

We designed our platform to be extensible, enabling other AI assistants to leverage its intelligence.

We've implemented a **Model Context Protocol (MCP) Server**, a standardized wrapper that allows AI assistants like Claude or GPT-4 to use our system's capabilities as tools.



Available Tools for AI Assistants

1. search_regulations
2. get_regulation_detail
3. ask_legal_question
4. check_compliance
5. validate_field
6. extract_legal_entities
7. analyze_query

This transforms our project into a foundational regulatory intelligence layer for the broader government AI ecosystem.

Our MVP is focused and complete, with a clear and actionable roadmap to production.

Acknowledging the Gap: Guided Workflows

The user-facing workflow engine was intentionally deferred to focus on the core data intelligence engine for the MVP.

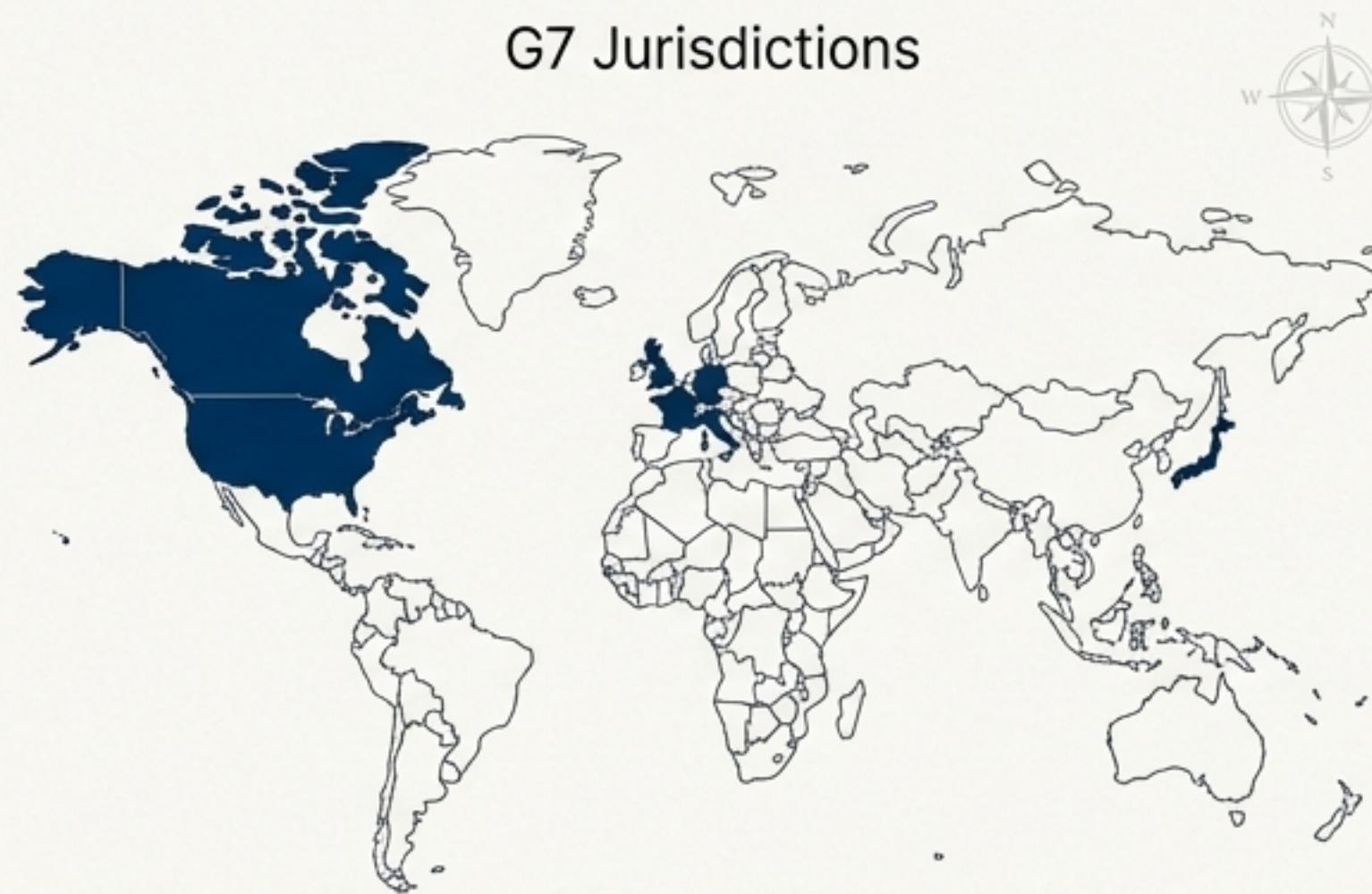
- **What Exists:** Foundational database models are in place.
- **Effort to Implement:** Estimated 3-5 days for a full-stack team.

Path to Production

- ✓ 1. **Expand Dataset:** Scale from 100 to 500+ Canadian regulations.
- ✓ 2. **Implement Security:** Add JWT authentication and Role-Based Access Control (RBAC).
- ✓ 3. **Add Audit Logging:** Create an audit trail for all queries and compliance checks.
- ✓ 4. **Build Change Monitoring:** Implement real-time alerts for regulatory amendments.
- ✓ 5. **Implement Guided Workflows:** Build the full workflow engine and UI.

Our vision extends beyond a single nation to a unified regulatory intelligence platform for the G7.

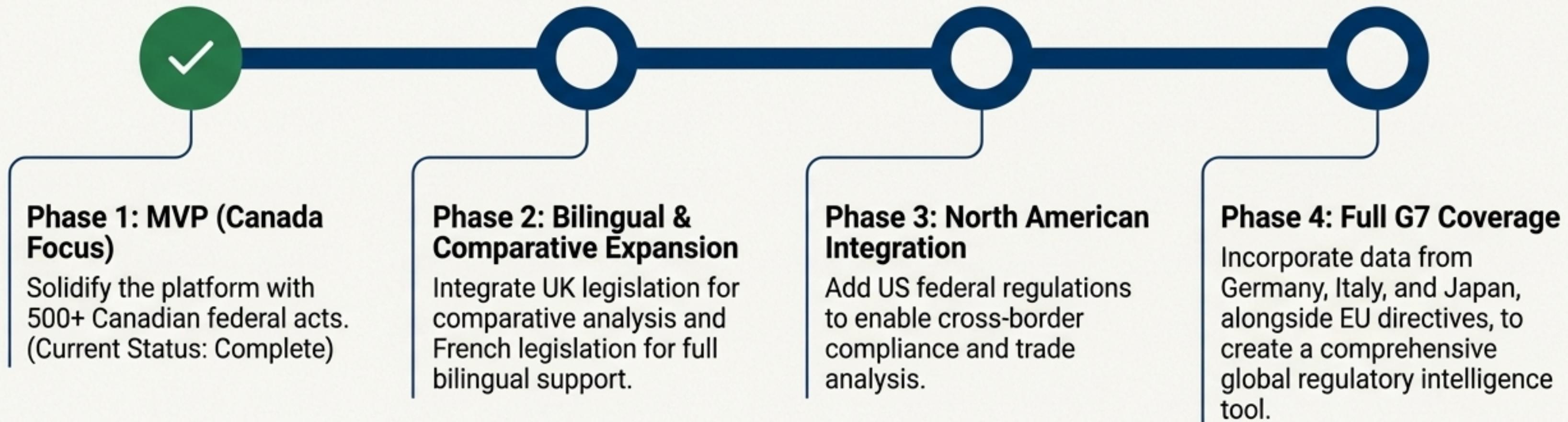
The system was designed for multi-jurisdiction support from day one. We have developed a comprehensive plan to ingest, parse, and integrate regulatory data from all G7 members.



Data Source Comparison

Country	Source	Format	Quality	Priority
🇨🇦 Canada	Justice Laws	XML	★★★★★	High
🇬🇧 UK	legislation.gov.uk	XML/API	★★★★★	Medium
🇫🇷 France	Légifrance	XML/JSON	★★★★★	Medium
🇺🇸 USA	GovInfo (GPO)	XML	★★★★★	Medium
🇪🇺 EU	EUR-Lex	XML	★★★★★	Medium
🇩🇪 Germany	Gesetze im Internet	XML/HTML	★★★★★	Low
🇮🇹 Italy	Normattiva	HTML/XML	★★★	Low
🇯🇵 Japan	e-Gov	HTML	★★★	Low

We propose a phased strategy for building a truly international G7 platform.



The Regulatory Intelligence Assistant provides the technical foundation and a strategic roadmap to solve the challenge of navigating complex regulations, not just for one country, but for the entire G7.